# ATTACHMENT A

Joint IOU Workshop Report

# REPORT ON THE NOVEMBER 10, 2015 WORKSHOP REGARDING INTEGRATION CAPACITY ANALYSIS METHODOLOGIES AND INTEGRATION CAPACITY ANALYSIS DEMONSTRATION PROJECT A

## (R.14-08-013 et al)

In accordance with Energy Division's request, Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), and Southern California Edison Company (SCE) (together, the "IOUs") submit the following Report regarding the Integration Capacity Analysis (ICA) topics discussed at the November 10, 2015 ICA Workshop.

## I. INTRODUCTION AND BACKGROUND

On November 10, 2015, Energy Division (ED) held a workshop to discuss the Integration Capacity Analysis (ICA) methodologies and ICA demonstration projects proposed by PG&E, SDG&E and SCE.

The purpose of the workshop was to provide a forum for the IOUs to 1) address questions related to the status and potential improvements regarding the data, assumptions and results associated with their respective ICA methodologies, 2) examine how the ICA demonstration projects A (ICA demonstration) will further aid in improving the ICA methodology and verifying the results, and 3) receive stakeholder feedback.

Section II of this Report provides a summary of workshop presentations and stakeholder comments.

Section III of this Report is organized per the workshop agenda as follows:

- Section A: Welcome and Introductions
- Section B: IOU Presentation on ICA Methodology
- Section C: ORA Analysis of PG&E ICA Methodology
- Section D: ICA Demonstration Project A Presentation

## II. SUMMARY OF WORKSHOP PRESENTATIONS AND STAKEHOLDER COMMENTS

### Summary of Workshop Presentations and Stakeholder Comments

**ICA Methodologies:** After the presentations by the IOUs and ORA on the ICA methodologies and application of the ICA methodologies to Demonstration Project A, stakeholders asked questions and provided comments on the presentations. Based on the stakeholders' questions and comments, stakeholders appear to be interested in understanding and being able to compare the intricacies (i.e., sources and verification of data, formulas, result verification methods, etc.) associated with each IOU's ICA methodology. The IOUs have provided what the Energy Division has characterized as an unprecedented amount and level of information that is publicly available on the CPUC website[1] including online detailed maps and ICA results in spreadsheet format. PG&E further provided load profile data online. Additionally, the IOUs in responding to stakeholder comments and questions agreed that there are some inconsistencies in the maps displays and further effort is warranted to develop a more uniform format (e.g., consistent color legend). Stakeholders suggested that the data provided on the ICA maps was in some cases representative and not necessarily sufficiently accurate for entities to use as a basis for making business decisions and that it should be caveated as such. The CPUC Energy Division staff expressed that at this stage, the ICA methodologies are not yet approved and stakeholders should not have an expectation of accuracy for commercial decision-making. The IOUs encouraged more dialogue on whether modeling specific scenarios would be valuable or would risk portfolio solutions being prejudged. The IOUs stated a preference of analyses being technology inclusive. ORA presented the results of its evaluation of PG&E's ICA methodology that identified twelve criteria to use to determine if an ICA methodology is effective.

**ICA Demonstration Projects:** The IOU presentations and stakeholder comments indicated that the proposed ICA demonstration projects for each IOU differ in scale but are consistent in purpose, which is to validate that the ICA tools and methodologies can be used on a system-wide basis. The ICA demonstration results will differ from the ICA results provided as part of the July 1, 2015 filing (i.e., the current results) primarily due to the planned utilization of dynamic time-series modeling techniques in the demonstrations. Stakeholders' questions generally

[1] http://www.cpuc.ca.gov/PUC/energy/drp/

pertained to verification and scalability of ICA results. Stakeholders would like to see the IOUs better articulate goals and metrics from which to identify and measure ICA demonstration success.

SDG&E: The ICA demonstration will use 8760 hourly load and generation profiles vs. the current method that uses only the maximum and minimum load hours to derive the ICA results.

SCE: The ICA demonstration consists of a comprehensive study for a selected Distribution Planning Area (DPA) rather than the initial modeling that utilized 30 representative circuits and extrapolated results. SCE's ICA demonstration will perform a dynamic hourly time-series analysis on all the 12KV distribution circuits in a specific area in Orange county, CA (Johanna A Substation Distribution Planning Area) and will evaluate the impacts on additional criteria (e.g. substation, sub-transmission and transmission circuit impacts on ICA).

PG&E: The ICA demonstration will use load shapes that incorporate more detailed information applicable to the power flow analysis. PG&E is evaluating to what extent the current ICA methodologies will incorporate transmission and sub-transmission constraints.

## III. REPORT

### A. Welcome and Introductions

Presenter: J. David Erickson, Energy Division.

**ICA Background:** ICA is a measure of the quantity (MW) and type (load/charge or generation/discharge) of Distributed Energy Resources (DERs) the current distribution network can accommodate without exceeding thresholds established for thermal, protection, or voltage limits. The ICA quantitatively identifies the hosting capacity for a line section or node, which provides a more granular level of information to developers, customers, and third parties who

are interested in integrating DERs compared to the hosting capacity values currently only available at a substation level.

The IOUs provided their respective ICA results in detailed on-line GIS maps and excel spreadsheet formats. The ICA is one of the foundational requirements that builds capabilities for the IOUs to identify optimal locations for DER development, and for third parties to evaluate incorporating DER portfolios. Ultimately, one of the objectives of the ICA is to inform and improve the efficiency of Rule 21 grid interconnection process while maintaining the applicable safety and reliability standards.

**ICA Demonstration background**: The objective of the ICA Demonstration is to more thoroughly evaluate a circuit's hosting capacity under different scenarios; including modeling DER penetration levels that cause the supply of electricity on a circuit to exceed the demand for electricity thereby causing power to flow back into the bulk transmission system (i.e. reverse power flow). This scenario, which was not considered as part of the IOU's current ICA results, is important because it helps develop a more complete understanding of possible constraints to DER integration. Under this demonstration project, the ICA methodology is to be applied to all line sections or nodes within a selected modeled area.

## B. IOU Presentation on ICA Methodologies

### 1. ICA Overview Presentation and Key Findings

**Presenters:** Tom Russell, PE, PG&E; Roger Salas, PE, SCE; John Baranowski, PE, SDG&E

### ICA Overview

**The following summarizes the presentation by the IOU representative that corresponds with the referenced slide presentation.** [2]

For the past few years PG&E has made progress with DER studies and integration. In the interconnection proceeding, PG&E focused on how to change its approach to accelerate DER

[2] http://www.cpuc.ca.gov/NR/rdonlyres/A33367A9-56AE-4729-84BB-6301D7E68E28/0/CPUC_Workshop_111015_ICA_vFinal.pdf

integration. The ICA and related online maps support this objective by specifying how much DER hosting capacity may be available for a specific distribution line section or node with no significant upgrades. The ICA evaluates a DER's impact on the following power system criteria: equipment thermal ratings, protection limits, power quality and voltage, and safety standards. There are two different use cases for ICA: 1) customer use case - how much DERs customers can interconnect and 2) the planning use case – where additional distribution capacity may be required to accommodate DER growth.

With the ICA process, the IOUs are transitioning from the current general screening process to a more detailed study that can ultimately inform Rule 21 interconnections. The EPRI hosting capacity[3] is a useful proxy for what the IOUs are trying to achieve with their ICA methodologies. The ICA provides a proactive look to inform where DERs could be interconnected without triggering significant upgrades.

ICA goals: To inform "optimal locations" for siting DERs in conjunction with locational net benefits analyses (LNBA) results. The ICA will also seek to improve the interconnection process through coordination between this work product and each Utility's Rule 21 Interconnection Study Processes.

Common IOU methodology: The IOUs' DRPs identify and summarize the performance of their respective ICAs using a common methodology. The IOUs have leveraged advanced power flow tools that analyzed thresholds across certain power system criteria (equipment thermal ratings, protection limits, power quality and voltage, and safety[4]) to conduct their ICA. Results were obtained at the line section or at the node level and displayed on on-line maps. The next step is to continue developing the tools and methodologies in a coordinated effort with the rest of the industry (e.g., external software vendors).

[3] http://www.cpuc.ca.gov/NR/rdonlyres/4976BE4E-A9CA-4B2C-91CD-E890219526AE/0/09CPUCIGPresentation_1815_final.pdf

[4] SCE and SDG&E did not use specific safety criteria because meeting the other criteria ensures safety.

New Tools and Techniques: The IOUs are exploring tools and techniques to improve the ICA methodology. The IOUs anticipate that the research community and software developers will experiment with tools and techniques to calculate integration capacity.

Tools and Data Required: For the initial analysis (i.e., the current results), each IOU took a slightly different approach to analyze their circuits based on the availability of information and maturity of tools (i.e. CYMDIST versus SYNERGI). To scale the ICA, a more automated process is needed. The IOUs made the ICA results available on-line via an expanded Renewable Auction Mechanism (RAM) maps platform, and updating these on a regular basis will require an automated batching process to efficiently analyze the thousands of circuits. Additionally, it is important to understand the changes to load profiles caused by DERs because minimum generation profiles can vary circuit to circuit which affect the ICA results. Supervisory Control and Data Acquisition (SCADA) systems on the distribution grid and smart meters are instrumental to providing data to help identify and estimate actual load.[5]

**Methodology and Calculations[6]**

The IOUs used equipment thermal, voltage, and protection thresholds to determine ICA on each node or line section. The implementation details differed due to the availability of models, data, and other resources. SCE used 30 representative circuits to conduct the ICA. Once the circuits were selected, SCE verified its model and proceeded to prepare each case and performed load flow analysis to determine limitations on each line section according to the thermal, voltage, and protection criteria. The results from these representative circuits were extrapolated to the remaining 4,000 + circuits in SCE's service territory. The extrapolation methodology was focused only on the mainline circuitry of each feeder.

Since PG&E and SDG&E performed the analysis on each distribution feeder there was no need to extrapolate results across the system. PG&E and SCE utilized CYME python scripting for analysis while SDG&E utilized SYNERGI Solver.

[5] See PG&E slide 3 for more information on the current tools and data sets used in ICA.
[6] SCE slides 4-6.

Circuit Granularity: The IOUs performed line section or node level calculations within the modeled circuit. The differences were based on utility dataset of circuit topology and connectivity. For SDG&E and SCE, line sections were determined by impedance. PG&E used line devices to establish line segments. SCE broke the circuits into 4 line sections; SDG&E into 3 line sections. PG&E's line sections per feeder varied with an average of 34 and maximum of 310 since different feeders have different amounts and arrangements of line devices.

Time Periods Analyzed: SCE and SDG&E used the peak and daytime minimum load values on each circuit while PG&E used a 24-hour period circuit profile for each of the 12 months.. For future analysis, dynamic time series hourly profiles are needed to determine DER impact throughout the day.

Criteria Assessed: The IOUs included elements of EPRI's streamlined methodology in their initial analyses. The IOUs recognize that future enhancements are needed to incorporate other criteria. Dynamic time-series analysis may address some additional considerations such as the impact of circuit reconfiguration in response to outages. The initial ICA was conducted assuming a static steady-state under normal conditions and did not take into account how ICA would change with differing distribution circuit configurations. More analysis is needed to understand how these abnormal configurations affect DERs.

**ICA Results**[7]

As part of the 2015 DRP, each IOU published the results of their ICA down to the line segment for all of their 12 KV distribution circuits. The following results were published for each line section: SCE – load and generation limits, SDG&E – generation limit, PG&E –load, generation, and DER scenario limits. The ICA results from SCE's initial analysis aligned with a parallel study performed by EPRI that used the same parameters. Future ICA enhancements could include: transmission limitations, improvement of datasets and electrical models, integrating planning tools, and creating an efficient analysis process.

[7] SDG&E slides 7-8.

Key ICA findings:

- ICA values are highly influenced by the resistance/impedance of the line segment, and a circuit's impedance generally increases the further it is from the substation. In general, the smaller the impedance, the higher the integration capacity.
- ICA values are generally higher on a circuit that is operating at a higher voltage level – 4kV circuits generally have lower ICA values compared to 12 kV circuits.
- In general, higher minimum loading creates higher integration capacity of a circuit for the voltage criteria. However, the capacity may be limited by thermal or protection factors. (e.g., more PV can be hosted on feeders with daytime peaks where the daytime minimum load is higher.)

ICA Updates: Updating the integration capacity analysis will depend on data availability, cost, feasibility, and commercial use cases, recognizing that efficiency may be gained by only updating when conditions or commercial needs change materially. The IOUs are in the process of upgrading and enhancing tools to accommodate improved analyses. Engineers typically analyze one circuit at a time based upon specific need or interconnection request. Faster processes need to be implemented for analyzing circuit line sections to provide information in advance of seeking interconnection. It is important to note that integration capacity is a snap shot in time. The frequency of map updates needs to be consistent with the frequency of changes on the circuits.

- **Batch processing and data conditioning** must be performed in order to analyze up-to-date circuit conditions.
- **Periodic map updates**: The initial goal is to provide updates periodically through the year, or as often as circuit reconfigurations warrant. Circuits that are experiencing continuous load profile changes due to ongoing DER and/or load growth changes may warrant more frequent updates.
- **Uniform Look**: Update map pop up boxes to look more uniform with consistent color use.

Integration Capacity Methodology: The IOUs recognize there are opportunities to improve the ICA methodology, including:

- Incorporating lessons learned from the ICA demonstrations

- Coordinating with research work and development being performed by software vendors
- Creating an integrated approach with the planning tools reducing requirements for manual data processing and conditioning
- Ensuring comprehensive network models for each circuit
- Evaluating inclusion of transmission, sub-transmission, and substation level assessment when evaluating irrespective of reverse flow through substation.

Informing Other Utility Processes:

- A regularly performed streamlined process that can provide locational results to help inform the Fast Track limits and/or specific thresholds within the Rule 21 interconnection process.
- Provide DER capacity data for analysis in conjunction with DER growth to inform General Rate Case investments where grid reinforcement is needed in high growth and low capacity areas.

**2. Stakeholder Question and Answer Session/Comments**

SCE's ICA approach: When is SCE changing its ICA methodology? SCE stated it would be transitioning from a clustered, representative feeder approach, to modeling the rest of SCE's circuits. As provided in the DRP, SCE plans to have ICA completed for all circuits by July of 2017 with results being updated as they become available. SCE anticipates being able to provide ICA updates for some circuits during 2016.

DER load profile data: Will the IOUs model DER bundles (e.g., solar + energy storage)? The IOUs encouraged more dialogue among stakeholders to consider the resources required to evaluate specific scenarios vs. evaluating the end profile. The IOUs stated a preference of being technology neutral, i.e., the circuit only sees the composite profile for a DER portfolio so the make-up of the portfolio does not matter. One stakeholder stated that it would be beneficial for DER developers if details of constraints were reported to aide in evaluating DER portfolios (e.g. time of thermal constraints).

Accuracy of currently available ICA results**:** Stakeholders encouraged the addition of caveats on the ICA maps to indicate that the currently posted information is preliminary and not intended to guide commercial decisions. ED and the IOUs reiterated that stakeholders need to be aware that the currently posted ICA results are categorized as informational only and result from a proposed methodology not yet approved by the CPUC.

SCE's consideration of hourly profiles: When asked whether SCE was considering LoadSEER as a potential vendor, SCE stated that LoadSEER was considered for some elements of its analysis but ultimately SCE did not incorporate hourly profiles to the generation and load limits of ICA.

ICA involves two different models: The ED and IOUs explained that the ICA methodology relies on two different models: 1) distribution network or power flow model and 2) a load forecasting model. These models support the ICA to conduct power flow analysis based on existing industry standards; and developing hourly load profiles for each circuit. The forecasting model develops hourly profiles taking into account different types of DER. DER affecting the load forecast includes energy efficiency, demand response, and charging energy storage and electric vehicles, and DER affecting the supply forecast includes distributed generation, discharging energy storage, solar PV, and other types of distributed generation.

ICA to model all DERs: Stakeholders voiced concern that the ICAs appear to focus only on generation type DERs while the DRP is to evaluate non-generation type DERs as well, and also noted that EE and DR may actually increase hosting capacity. PG&E and SCE's ICAs include both a generation integration capacity value and a load integration capacity value that represent respectively the amount of generation or load the system may be capable of supporting in its current configuration. SDG&E stated that load/charging analysis will be included in future efforts.

Hourly load and generation profiles: Stakeholders voiced a need to understand the base assumptions used to develop load and generation profiles associated with each of the three DER growth scenarios.

Criteria limiting hosting capacity: Knowing which of the three (voltage, thermal, protection) limiting thresholds is triggered may enable stakeholders to offer solutions that address and remove that limit.

Criteria of thermal ratings: Stakeholders wanted to know the similarities and differences of the limiting criteria of each IOU, starting with criteria of thermal ratings. The IOUs responded that ratings are based on different manufacturing equipment. IOUs also have different protocols regarding when and where to apply conservation voltage reductions.

ICA reflecting transmission constraints: Addressing the stakeholder question relating to CAISO's Distributed Energy Resource Provider (DERP) activities, PG&E mentioned that behind the meter DER providing wholesale services to the CAISO through WDT / WDAT needs to be evaluated within the context of an ICA that evaluates backflow situations and possibly also models certain transmission and sub-transmission constraints. The IOUs are still evaluating to what extent the current ICA methodologies will incorporate transmission and sub-transmission constraints.

ICA and interconnection process: Some developers desire an expanded on-line ICA results tool that replaces the current interconnection process. While one of the goals of the ICA is to inform and streamline the interconnection process, CPUC approval of the ICA methodology is required including pilot verification of the CPUC provisionally approved ICA methodologies.

ICA and planned upgrades: Stakeholders asked whether the ICA can indicate where planned upgrades will occur. The IOUs responded that near-term planned upgrades are already embedded in the ICA. ED stated that the Locational Net Benefits Analysis will also be helpful because it further identifies the optimal locations.

ICA and dynamic analysis: ED asked the IOUs to explain the dynamic analysis and when the IOUs expect to have the capability available. SDG&E is in the process of updating its power flow tools to have this capability, which includes adding new modules in Synergy. PG&E stated that they did a general dynamic analysis on load shapes with limited utilization of power flow simulation. Future development of dynamic time series power flow will be explored with consideration to excessive processing requirements. PG&E used a limited set of DER scenarios with different

shapes to showcase varying results in ICA by DER. SCE characterizes the dynamic analysis as time-series analysis, and is in the process of preparing the load profile and generation profile to perform the dynamic analysis for Demonstration A.

ICA and model validation: Stakeholders stated that validating models can be difficult and inconsistent because instrumentation data is not available to validate the power flow model in the tools. SDG&E responded that its model is based on equipment in the field, which includes and leverages its AMI data. PG&E states that power flow models are driven by granularity of GIS models. SCE stated that additional data inputs to the model are required to improve accuracy levels and that their grid modernization activities (output from sensors) as well as data from their Preferred Resource Pilot will increase the ability to validate model results.

ICA and third party partnerships: The IOUs were asked of their plans to work with third parties, like inverter manufacturers and solar companies whose equipment may be able to capture data that is beneficial to improve model results. PG&E stated it may not be useful to cover the end point data, but believes that DG data can be useful to investigate voltage and power quality issues. SCE stated that more data is better, as this information could aid in the real-time operations, maintenance and planning of the distribution system.

ICA and limitations and uncertainties: Stakeholders asked for more description of the IOUs validation approaches including uncertainties in boundaries to the ICA, model parameters, input data and how to use modeling data in decision making. One stakeholder suggested that it should be recognized that uncertainties and error margins are a natural result of any complex modeling. Considerations in the modeling techniques should consider uncertainties in input data and their impacts on the results should be addressed. The IOUs understand the importance of this issue while the solution may be difficult. PG&E addressed that most uncertainty will reside in customer behavior and load profiles and should be addressed in load profile development.

ICA and input data of rooftop PV: SDG&E tracks actual PV performance via measurement of systems participating in pilots, and has a meteorology group that uses weather models to better understand the weather – PV output correlations. However, a 24x7 analysis is not yet available.

PG&E suggested that additional discussions between the IOUs and stakeholders would help all parties better understand the telemetry issues.

ICA model and safety factor: Is there a safety factor built into the ICA model? The IOUs confirmed that safety factors are fundamentally built into establishing each of the three threshold limits, and that safety is not a separately modeled factor.

ICA models and monthly updates: If it is inefficient to do a monthly update, what type of methodology would the IOUs do for an abbreviated update based on interconnection applications? SDG&E stated it would update based on an existing process that identifies when a circuit's configuration and or other modeling data has changed. SCE stated that the ultimate goal is frequently provide information that is as accurate as possible. PG&E stated that if nothing changes on a particular circuit, then there is no point in expending the resources to perform an analysis.

ICA and load model: How do you interpret the ICA numbers for different types of DG (residential, commercial, and wholesale)? SCE stated that the capacity values shown on the maps are not dependent on the customer class or the type of generation technology. PG&E stated that it depends at the granularity of the analysis. Wholesale PV can be evaluated at the substation and smaller PV systems would be evaluated on individual line segments.

## C. ORA Analysis of PG&E ICA Methodology

### 1. ORA Presentation (Tom Roberts, ORA)

The Office of Ratepayer Advocates (ORA) provided its preliminary assessment of the ICA methodologies. The goal was to provide a way to look at PG&E's ICA relative to whether it should be used for ICA Demonstration. Please refer to ORA's presentation, which is attached to this Report.

**ORA's DRP Objectives:**

- Ensure CPUC and state policies are correctly implemented
- Avoid artificial barriers to DER interconnection
- Avoid unreasonable ratepayer expenditures for distribution infrastructure upgrades
- Realize maximum ratepayer savings for DRP investments

ORA's presentation is based on a set of six data requests related to PG&E's DRP, existing assets/facilities, distribution planning, and 43 questions focused on ICA. ORA stated that PG&E's responses were generally helpful in building a better understanding of its ICA methodology.

**ICA Flow Charts**: ORA synthesized the data responses into draft flow charts of PG&E's ICA process. ORA also established a list of ICA effectiveness criteria, but open questions remain. The draft process charts are intended to help stakeholders and CPUC staff to understand ICA data, sources, process, tests, and all tools as well as provide an outline for PG&E to correct and further flesh out.[8]

**Twelve Proposed ICA Effectiveness Criteria:** 1) Accurate and meaningful results, 2) transparent methodology, 3) Uniform process that is consistently applied, 4) complete coverage of service territory, 5) Useful formats for results, 6) Consistent with industry, state and federal standards, 7) Accommodate portfolios of DER on one feeder, 8) Reasonable resolution – space and temporal, 9) Easy to update based on improved and approved changes in methodology, 10) Easy to update based on changes in inputs (loads, DER portfolio, DER penetration, circuit changes, assumptions, etc.), 11) Consistent methodologies across large IOUs; 12) Methodology accommodates variations in local distribution system, such that case by case or distribution planning area specific modifications are not needed.

**Seven Proposed Keys to Accurate and Meaningful Results:** 1) Meaningful scenarios, 2) Reasonable technology assumptions, 3) Accurate inputs (i.e., load and DER profiles), 4) Reasonable tests (i.e., voltage flicker), 5) Reasonable test criteria (i.e., 3% flicker allowed), 6) Tests and analysis performed consistently using proven tools, or vetted methodology, 7) Meaningful result metrics provided in useful formats.

[8] See slides 6-8.

**Preliminary Observations:**

- Limiting the scope to 3-phase circuits leaves out a large portion of feeders (49% based on mileage, 63% based on customers).
- Automating tests via script/codes helps ensure consistency, but full vetting and QA/QC is required.
- Granularity of analysis is currently limited by aggregate customer class load profiles.
- Test/criteria (thermal v. flicker) driving IC from each line segment is currently not available.

**Preliminary Conclusions:**

- Each IOU should provide full documentation of entire ICA methodology and QA/QC procedures to all parties, including flowcharts of entire methodology.
- Each IOU should develop a flow chart of the ICA process.
- Stakeholders and CPUC staff should be allowed time to review these additional details before a determination of ICA adequacy and consistency is made.
- ORA looks forward to working with utilities to fully understand the ICAs, and working with CPUC staff and parties to help ensure the ICAs meet consensus effectiveness criteria.

PG&E stated that ORA appeared to have done a good job in representing PG&E's ICA but that a follow-up conversation was warranted.

## 2. Stakeholder Question and Answer Session/Comments

Validating ICA methodologies: Stakeholders showed interest in ORA's evaluation of PG&E's proposed ICA methodology. PG&E recommended an ICA technical working group to evaluate and compare the IOUs' respective ICA methodologies.

ICA's most limiting criteria: When asked which criteria are more limiting and which asset upgrades are updated more often, SDG&E mentioned steady state voltage, SCE mentioned voltage control, and PG&E stated that those details were not analyzed at this stage.

## D. ICA Demonstration Projects A

### 1. ICA Demonstration Project A Overview

**Presenters:** Tom Russell, PE, PG&E; Roger Salas, PE, SCE; John Baranowski, PE, SDG&E

Different scale but same objective: SDG&E anticipates performing an ICA demonstration on a system-wide basis; PG&E's demonstration will focus on an area in the Central Fresno planning area; and SCE's demonstration will focus on an area in Orange County. The ICA demonstrations will serve two main objectives: A means to validate the IOU's ICA tools and methodologies as a vetting tool that can be applied across the entire distribution system; and to provide an opportunity to look at ICA from the overall systems perspective including substation, sub-transmission, and transmission limitations. The Energy Division characterized this second objective as a stretch goal.

ICA Demonstration compared with current analysis:

*SDG&E*: The ICA used in the demonstration will utilize 8760 hourly load and generation profiles and perform a dynamic time-series analysis rather than the static steady-state analysis that only used maximum and minimum load hours to derive the current ICA results.

*SCE*: The ICA demonstration will model actual load data from all three phases rather than just one phase and will also model each circuit's characteristics rather than utilizing 30 representative circuits. The demo will include additional criteria including substation, sub-transmission and transmission impact and will perform dynamic time-series analysis.

PG&E: The ICA demo will use load shapes that incorporate more detailed information that is applicable to the power flow analysis as well as evaluating transmission impacts.

Physical Location of the ICA demonstrations:

PG&E selected the central Fresno area to apply different restoration techniques and operational flexibility. There is a buffer of restoration capacity shrinking. The Fresno region has a high potential for third party resources.

SCE's ICA demonstration is located within an area of need due to SONGs closure. SCE selected a high-density area near John Wayne Airport in Orange County. The area consists of about 75% residential customers and some commercial customers and is in the Preferred Resource Pilot area, where SCE plans to conduct Demonstration C. The study results from the ICA Demonstration will inform and support Demonstrations B and C.

SDG&E plans to look at its whole system depending on processing time using 24-hour profiles across the system. There is a mix of rural and urban areas in each of its six districts and plan to test different segments of the system.

## 2. Stakeholder Question and Answer Session/Comments

ICA demonstration benchmarks: Stakeholders asked what external benchmarks could help the CPUC decide the best way to model the ICA process, as there needs to be some best practices. PG&E identified the EPRI PV Hosting Capacity study as providing best practices in the field. SCE stated that its practices implemented as part of the ICA methodology are based on industry standards and that EPRI performed an independent study of SCE's approach that arrived at relatively similar conclusions.

ICA demonstration and DER portfolios: One stakeholder suggested designing a demonstration to evaluate if/how a set of DER portfolios may increase a circuit's hosting capacity. The IOUs responded that the demos do not evaluate the potential effects of any specific DER technology because it's the composite profile that matters and different portfolio mixes could result in similar composite profiles. PG&E clarified that the analyses does not just evaluate the impacts of DERs that generate electricity, i.e., PV but also evaluate the impacts of DERs that directly impact load, *i.e.*, EE and DR. SDG&E is technology neutral and does not want to recommend a particular portfolio for a location because that may limit DER integration opportunities. The ED reiterated that it is not practical for the IOUs to simulate all possible portfolios and that there needs to be a way for third parties to efficiently evaluate how a specific DER portfolio fits within to the IOUs' analysis and results.

ICA demonstrations and scalability: How do we scale ICA demonstrations to the rest of the system? PG&E stated that because its approach is developing its tools, including automation, it will be helpful towards applying across the entire system. SCE stated that the purpose of the project was to focus on a defined area, conduct comprehensive analysis, and once validated, to apply the same approach on a system-wide analysis.

Stakeholder participation in IOU Tool Development Process: What does it take for IOUs to get a unified tool to allow all stakeholders to participate? PG&E believes that it can leverage coordination with software vendors. PG&E is working with vendors to encourage inclusion of the same commonly used scripts within the respective models. This could lead to the methodology becoming commercially available. SDG&E offered that commercially available tools that reflect the analyses being adopted in CA will likely become more prevalent as other utilities and states start implementing similar analyses.

ICA Demonstration and Reconciling Inaccuracies: What are the IOUs basing ICA demonstration on and how do the IOUs reconcile the inaccuracies to get meaningful results? SCE replied that the goal is to perform ICAs on a more concrete set of data and to use automated systems (sensors, etc.) to validate information. SDG&E plans to have load profiles integrated into the entire system. PG&E plans on coordinating with other DRP demonstration projects to reconcile actual integration data points that would be tracked during implementation. .